Japanese Armored Vehicle Development

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The killing in Cambodia continues. China threatens Taiwan. North Korea announces that it will no longer respect the Korean truce agreement and moves combat elements into the Demilitarized Zone. Okinawans object to the continued presence of U.S. troops. President Clinton travels to Japan and renews the Japan-U.S. security agreement and promises to maintain 100,000 troops in the Far East. Meanwhile, U.S. troop strength in Europe has reached its lowest level since World War II.

Japan is building about 20 of these Type 90 tanks each year.

In Germany for fifty years after World War II, the U.S. armor community has known its German ally. It watched the post-war development of a renewed German Army and followed the development of its armored vehicles: Leopard I and 2, Marder, and others. Now, with eyes turned more to the Far East, it behooves us to learn more about the armed forces of Japan, the Japanese Self Defense Force. Few Americans realize, for example, that the U.S. and Japan together account for 40 percent of the world's defense spending and that Japan is third in the world in allocating funds to defense.

History

The start of Japanese military mechanization can be traced to 1918, when several Mark IV tanks were obtained from England. A few other wartime tanks, such as the French Renault FT (called "Ko" or "A" in Japan) and the British Medium Mark A, were delivered some time later. Little more was accomplished until 1925, when the Japanese formed two tank companies to develop tactics and launched a domestic tank development program.

Japanese tank design began with completion at the Osaka Arsenal in 1927 of a prototype vehicle known as "Experimental Heavy Tank 1," a 19-ton tank with a main turret mounting a 57mm gun and two smaller turrets with machine guns. After several additional heavy tank prototypes were developed in the 1930s, the Japanese dropped the heavy tank concept.

Continued development of both light and medium tanks resulted ultimately in production of some 5,000 tanks during the war, making Japan sixth in wartime tank production, behind the U.S., UK, France, Germany, and the USSR. The final Japanese medium tank of the war was a 37-ton vehicle mounting a 75mm gun of questionable value.

The major obstacle to Japanese tank development during the pre-war and wartime period was the philosophy that the primary role of tanks was infantry support. The major areas of progress in Japanese tank design were in the early adoption of diesel power and in development of amphibious tanks.

Little effort was devoted during the period to the development of other fighting vehicles. The Japanese abandoned the concept of wheeled armored vehicles because most Far East terrain favored tracked vehicles. A tracked combat car mounting a machine gun was dropped in favor of a light tank.

Post World War II

From the end of World War II until formation of a security police force in 1951, Japan had no armed forces of any type. In 1954, the security police force, which had been under control of the U.S. occupying force, became the Japan Defense Agency (JDA). Because of the background of U.S. control, the JDA was organized and operated in a manner similar to U.S. forces and was generally supplied with U.S. equipment. The first armored vehicles were M4A3, M24, and M41 tanks and half-tracks. Ground Self Defense Force (GSDF) officers, most of whom had served during the war in the Japanese Army, found U.S. equipment greatly superior in performance to Japanese armored vehicles, all of which had been destroyed anyway.

Equipping the GSDF with U.S. armored vehicles quickly closed the technology gap that resulted from lack of Japanese post-war development. The standard caliber Japanese tank gun of 57mm, with an 800 m/s muzzle velocity, was now replaced by the U.S. 90mm gun, with its 1,000 m/s muzzle velocity. The U.S. 20 HP/ton replaced the Japanese 15 HP/ton or less vehicles, providing significantly more mobility. The U.S. 100mm of armor protection doubled that of earlier Japanese tanks.

The Japanese public attitude in 1950 was a strong desire for peace, and there was little enthusiasm for rearmament. However, the U.S., involved in the Korean War and watching the growing Soviet threat in Europe, sought assistance in an Asian defense and began to encourage a Japanese rearmament program. In responding to this encouragement, Japan concluded that it should redevelop its own armament industry. It was a defense industry that had pre-

The Type 61, above, was Japan's first postwar tank design. It mounted a 90mm gun.

The Type 74, at left, was upgunned to 105mm, with a modern fire control system and hydropneumatic suspension. The suspension and turret shape are reminiscent of the Soviet T-62.

The tank recovery vehicle above is a variant of Japan's new Type 90 MBT. There is also a bridgelayer variant.

At left, the Type 87 wheeled armored reconnaissance vehicle was developed to take advantage of Japan's excellent road network. An 8-wheeled vehicle is also under development.

viously been quite capable, having produced such weapon systems as the battleship Yamato, once the world's largest, and the Zero fighter plane.

The Type 61 MBT

In the 1950s, the major military powers were developing "second generation" main battle tanks: AMX30 in France, Leopard 1 in Germany, Chieftain in the UK, M60 in the U.S., and T62 in the USSR. Sweden and Switzerland were also developing new tanks, respectively known as the S-tank and the Pz58 (ultimately produced as the Pz61).

The GSDF, though, was equipped with only the M4A3 and the M24. A few M47 tanks were supplied by the U.S. for test, but proved to be unsatisfactory. They were not designed with the smaller stature of GSDF crewmen in mind, and their bulk and weight made them unsuitable for transportation in many parts of Japan. A decision was made for the GSDF to develop and produce a national tank. The main object of the development was to produce a 90mm gun tank suitable for Japanese body size and topography. Development proceeded along the following lines:

- 90mm gun and its fire control system.
- 500HP class diesel engine and transmission
- Torsion bar suspension system
- Hydraulic gun control system
- Homogeneous armor and a welded hull

The diesel engine and the optics of the fire control system used technology developed during World War II. Other components were based on M4A3 and M24 technology and the know-how of Japanese industry. The first two prototypes were completed in 1957, and in 1961, the tank was type classified as the Type 61 MBT. Total production by Mitsubishi Heavy Industries was more than 500 tanks.

Although the Type 61 reestablished Japan as a tank developer and manufacturer, it was a first generation postwar tank and, by the time it was fielded, most major countries had fielded their second generation tanks and were already working on their third generation. The joint U.S.-German

MBT-70, the UK Challenger, French AMX40, and Soviet T72 programs were all underway. Thus, the GSDF felt that to establish a more credible and viable defense, it needed to initiate development of a second generation tank of its own that incorporated at least some third generation level features.

The Type 74 MBT

The GSDF and Mitsubishi Heavy Industries initiated concept studies in 1962 and test rigs were built and tested between 1964 and 1967. The first two prototypes were completed by Mitsubishi in early 1968.

The tank's main technical features were:

- A low silhouette and well-shaped hull to decrease vulnerability, somewhat similar to the T62
- 105mm gun
- 750HP multifuel engine capable of operating submerged
- Cross-drive type transmission
- Hydro-pneumatic suspension with hull attitude control
- Modern fire control system incorporating a laser rangefinder, electronic ballistic computer, gun stabilization system, and electric gun control system

The tank incorporated certain features of third generation tanks then in development in other countries, such as the hydro-pneumatic suspension similar to that of MBT-70. Although the laser rangefinder was procured from Nippon Electric and the computer from Mitsubishi Electric, continuing the trend of relying on Japanese industry, this was not exclusively the case. The 105mm gun was produced in Japan under license from the UK. German track from Diehl was tested at the production stage, but was ultimately not acceptable. In general, though, there was little technology exchange between Japan and other countries.

The first production contract was awarded in 1973 with the first tanks delivered in 1975. A total of about 870 were procured. Overall, the Type 74, even though it incorporated some very modern features, was a second generation equivalent, especially when considering the main armament. Thus, while making progress in its efforts to draw even with other tank-producing countries, Japan was still behind.

Type 90 MBT

In the mid-1970s, the GSDF set about to correct the situation, laying out a program to develop a truly advanced MBT. The JDA soon encountered the same challenges other countries were facing in their tank development efforts. Among these were:

- The rapid progress in technology, particularly electronic technology, that tended to make components obsolete before development was complete
- Pressure from government management to achieve greater cost-effectiveness and reduce cost growth
- Pressure to focus on longer range operational performance as time delays occur in the program

As a result of these factors, actual development of the Type 90 MBT took approximately 14 years, the tank not being type classified until 1991. Nevertheless, the Type 90 incorporated a number of advanced features, some of them not found in contemporary models of the Abrams and Leopard 2. Some are found in the French Leclerc tank, developed generally in parallel with the Type 90.

With the exception of the 120mm main armament, licensed by Rheinmetall for production in Japan, Japanese industry developed all of the components. Main features of the Type 90 MBT are:

- 1500HP class compact diesel engine
- Electronic-controlled full-automatic transmission
- Hybrid suspension with independent hydropneumatic suspension
- All-weather fire control system, including automatic tracking
- Automatic loading system
- Composite armor

Several features in the tank are of particular interest. Although the turret is conventional in design, the automatic loader allowed reduction of the crew to three. The liquid-cooled engine is the first Japanese tank engine not to be air-cooled, a feature driven by size of the engine and consequent cooling requirement. The automatic tracking system is of unique design.

A major problem for the JDA has been the procurement cost of the tank, which has resulted in a low rate of production. Whereas the Type 74 was procured at a rate of about 60 per year, affordability has limited Type 90 production to about 20 per year. The result is that reequipping the GSDF with a modern tank is progressing slowly.

Other Armored Fighting Vehicles

Other than the MBT, Japanese AFVs fall into three categories: APCs, self-propelled artillery, and support tanks.

In general, APC development, procurement, and fielding has paralleled that of the tank. There have been three generations of APC:

- Type 60 APC: similar to the U.S. M75 APC
- Type 73 APC: similar to the U.S. M113 APC
- Type 89 APC: A vehicle similar in concept to the German Marder and U.S. Bradley Fighting Vehicle

Each of these vehicles has also been adapted for use as a family, including variants for mortars, observation, rocket launchers, chemical reconnaissance, etc.

Since the mid-1970s, the GSDF has considered that a wheeled armored vehicle might be more appropriate for Japanese use as an APC than a tracked vehicle, primarily because of the well-developed Japanese road network. Consequently, in 1975 the GSDF began development of a 6x6 wheeled armored vehicle. More recently, emphasis has been shifted to development of an 8x8 vehicle, as well.

The main self-propelled artillery of the GSDF includes the 155mm howitzer and the air-defense automatic weapon.

Initially, the 155mm SP howitzer was mounted on the 25-ton class AFV chassis and designated the Type 75 155mm Howitzer, SP. This weapon was essentially similar to the U.S. M109. In 1984, the GSDF began to introduce the U.S. M110 203mm SP Howitzer, built in Japan under license. Part of the reason for introducing the U.S. system was to help correct the Japanese-U.S. trade imbalance.

For an SP antiaircraft system, the GSDF adapted the Type 74 tank chassis to mount dual Swiss Oerlikon L90

35mm automatic cannon. Except for the weapon, all components of the system were developed in Japan. The system is designated Type 87 2x35 AWSP.

The support tank category includes primarily the tank recovery vehicle and the armored bridgelayer. These vehicles have each used the concurrent tank chassis as the basis for development.

Future Development

As with the rest of the world, Japan finds herself today living with an unpredictable future. The major potential threats to Japan are, of course, China and North Korea, both of which could cause Japan considerable problems. Consequently, Japan has concluded that it must maintain a modern defense force while, at the same time, strengthening mutual defense arrangements with the U.S.

Maintaining a modern defense force requires both development and procurement efforts. For now, the Type 90 MBT is adequate, matching or surpassing other modern tanks in capability. Thus, for the near term, efforts in the tank area will highlight component development. Component R&D efforts for a future MBT will be conducted in the following areas:

- Concept research for a twenty-first century MBT, to include vetronics research and manufacture of a test bed vehicle
- High-power diesel engine, including the use of ceramics
- Gas turbine research, especially to improve thermal efficiency
- Electric drive system
- Stepless hydromechanical full-automatic tank transmission
- Advanced suspension system, particularly active suspension
- Advanced armor technology, including composite armors, protection against top attack, active and reactive armors, etc.
- Main gun, including improvement of AP ammunition performance, advanced proximity fuze, and liquid propellant, electromechanical, and electrothermal technology

For other armored vehicles, for the immediate future, the plan is to concentrate efforts on upgrading equipment. Two specific programs are underway to field a new 155mm howitzer by replacing the Type 75 with the European FH70 mounted on the Type 89 chassis, and to replace the Type 73 APC with an 8x8 wheeled armored vehicle.

Economic factors demand that JDA efforts in the coming years use simulation extensively and that there be emphasis in the areas of cost effectiveness and generating savings in manpower and material. Environmental considerations will also require greater emphasis.

Armored Vehicle Manufacture in Japan

The nature of armored vehicle manufacture itself and the armament export restrictions of the Japanese constitution make the firms involved in the industry unique among Japanese companies. On the one hand, the particular expertise and equipment involved virtually eliminate competition within Japan, while, on the other hand, there is little prospect for expanding markets through export. Thus, the companies in the business have a strong relationship with the Japanese Government, but have little potential for expanding their armored vehicle production beyond GSDF needs.

There are essentially three armored vehicle manufacturers and one cannon manufacturer in Japan. Mitsubishi Heavy Industries (MHI) is the Japanese tank manufacturer and manufactures tracked APC families of vehicles, as well. Komatsu manufactures tracked and wheeled APC families. Hitachi manufactures small quantities of light armored vehicles. All of these companies can produce many of the components of various armored combat vehicles, such as hulls, turrets, tracks, engines, transmissions, suspension systems, and subcomponents. However, components such as armament, communications equipment, and optics are all procured from vendors.

Nippon Steel Manufacturer (NSM) is well-known in the world as a gun manufacturer and produces all of the cannons used on GSDF combat vehicles. Except for armament, components procured from vendors are manufactured by domestic companies whose main business is commercial.

In order to equip the GSDF more cost effectively, as well as to help overcome the balance of trade problem existing with many nations, the JDA has recently begun giving more consideration to obtaining licenses for domestic manufacture of foreign-developed weapon systems and components, as well as the procurement of foreign weapon systems and components themselves. This tendency is further supported by the general world-wide trend of internationalization of military equipment.

Summary

After a post-war lapse of several years in the area of combat vehicle design and manufacture, the creation of the JDA led to a reemergence of a Japanese military industry for the purpose of supporting the GSDF. Technologically behind the major armored vehicle manufacturers of the world for a number of years, Japanese heavy industry has responded to GSDF requirements by steadily improving its combat vehicle design and manufacturing capability. Meanwhile, the quality of Japanese commercial electronic and optical products has been reflected in the production of superior combat vehicle components. The result is that the GSDF is now receiving equipment on a quality par with the major military countries of the world, although budgetary restrictions and the generally antimilitary feeling within Japan are restricting the rate of modernization.

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